DOCUMENT RESUME

ED 222 358 SE 039 409

AUTHOR	Imel, Geri J.; And Others
TITLE	Energy: Yesterday, Today, and Tomorrow. An Interdisciplinary Approach. Revised.
INSTITUTION	Nebraska State Energy Office, Lincoln.
PUB DATE	Feb 81
NOTE	63p.; For related documents, see ED 179 395 and SE 039 406-416.
AVAILABLE FROM	Nebraska Energy Office, Extension Division Chief, P. O. Box 95085, Lincoln, NE 68509 ($5.00).
EDRS PRICE	MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS	Electrical Appliances; *Energy; *Energy Conservation; Environmental Education; Fuels; Interdisciplinary Approach; Junior High Schools; *Learning Activities; Natural Resources; *Science Activities; Science Education; *Secondary School Science; *Social Studies; Solar Radiation
IDENTIFIERS	*Energy Education; Nebraska

ABSTRACT

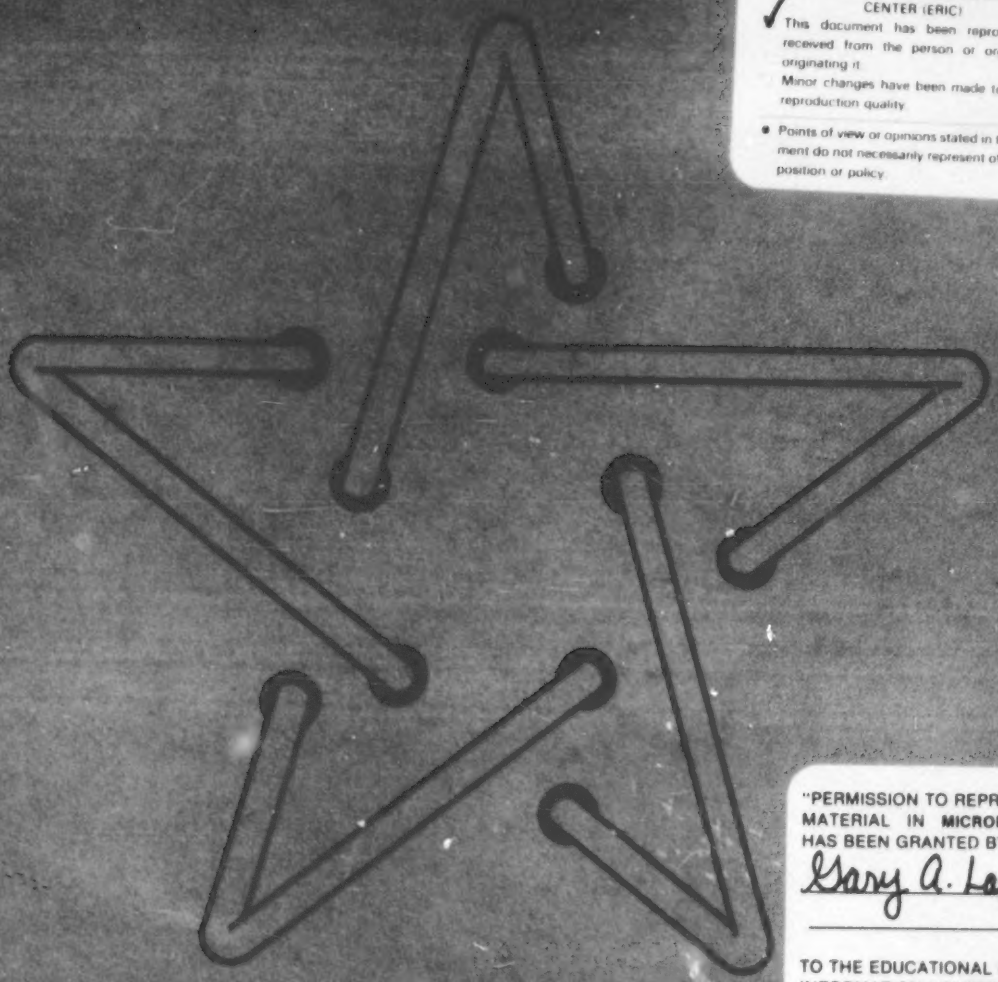
This three-part unit is designed to give grades 7-9 students practice in interpreting and analyzing information concerning use of energy in Nebraska. The first section is a general (generic) overview of the different kinds of energy resources and serves as an introduction to the problems of supplying ever-increasing energy needs. Activities in this section include graph-making, value clarification, electrical consumption analysis, and others. The second section (social studies) focuses on developing skills to face energy issues. Students write about a day without energy and use a rationale decision-making process in prioritizing their efforts to deal with energy problems. The third section contains science-related activities, including making fuel from grain and collecting the sun's energy. Activities in the social studies and science sections are optional. Rationale, objectives, and instructional strategies are provided for each unit. A list of process skills fostered, advanced teacher preparation, recommended time, goals, and planning guides for general, social studies, and science activities are also provided. (Author/JN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.
Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.



"PERMISSION TO REPRODUCE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

Gary A. Lay

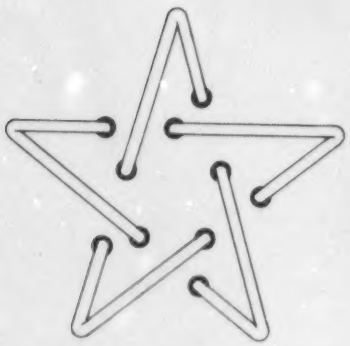
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

ENERGY: YESTERDAY, TODAY, AND TOMORROW

An Interdisciplinary Approach

ENERGY: YESTERDAY, TODAY, AND TOMORROW

An Interdisciplinary Approach



by

Geri J. Imel
Dianne J. Kennedy
Patty Kondo
Richard W. Lorrien
Susan D. Pierce
Nikki J. Scott
(revised)

Recommended Subjects: Energy use activities for junior high Social Studies and Science classes

Prepared for:

The Nebraska Energy Office

nebraska energy office
Help Conserve the Good Life of Nebraska

TABLE OF CONTENTS

PREFACE/INTRODUCTION 2
ABSTRACT 3
STUDENT OBJECTIVES/PLANNING GUIDE 4
EVALUATION SUGGESTIONS 6
GENERAL ACTIVITIES 7
#1 "How Nebraska Uses Energy"
#2 "Energy Inventory"
#3 "What Do We Use for Energy?"
#4 "Past, Present, and Future—The Energy Picture"
#5 "Common Home Appliances and Energy Consumption Data"
#6 "$25.00 Limit"
#7 "Insulation Makes a Difference"
#8 "It's Everyone's Job"
#9 "Energy Glossary Completion"
SOCIAL STUDIES ACTIVITIES 55
#1 "A Day Without Energy"
#2 "Your Energy Decisions"
#3 "Unscramble These Sentences"
#4 "Public Attitudes Influence Consumer Products"
SCIENCE ACTIVITIES 65
#1 "Energy Technology Review"
#2 "Gas From Grain"
#3 "Collecting the Sun's Energy"
SUPPLEMENTAL MATERIALS GUIDE 77
BOOKS 78
ENERGY INFORMATION REQUEST FORM 79

To the Instructor...

"Energy: Yesterday, Today, and Tomorrow" is a unit designed to give students practice in interpreting and analyzing information concerning the use of energy here in Nebraska. Students will work through a general section which contains activities in graph-making, value clarification on energy issues, electrical consumption analysis, and other thought-provoking activities. These are called general activities because students in all areas of study should be able to work through them.

In the social studies section, there are four activities which can be used to initiate general class discussion. These are **optional** activities which may require students to demonstrate additional research skills and understanding.

In the science section, there are three activities which focus more specifically on science. Again, these are **optional** activities which involve laboratory work. Students should be able to form some opinions about the energy situation. Discussion after each lab is therefore essential.

Finally, since material sources continue to change periodically, the source, **Energy Info—A Directory of Publications and Audio-Visual Materials From the Nebraska Energy Office**, contains a list of general topics and materials available from the Nebraska Energy Office. You are encouraged to use the ordering page attached to this unit to obtain this booklet as well as other energy-related materials.

Larry Scharmann, Education Coordinator
Nebraska Energy Office
P.O. Box 95055
Lincoln, NE 68509
(402) 471-2867

ENERGY: YESTERDAY, TODAY AND, TOMORROW

An Interdisciplinary Approach

Abstract

Probably no issue today is more far-reaching, controversial, or important to our way of life than the issue of how we use our energy resources. Decisions we make today will determine our options for tomorrow. In this packet of materials, students will have an opportunity to examine some elements of our energy situation today and make some determination about the kinds of decisions we should be making. The first section is a general (generic) overview of the different kinds of energy resources and serves as an introduction to the problems involved in supplying our ever—increasing energy needs.

The social studies section focuses on developing skills to face these issues. Students will write about a day without energy as well as use a rational decision-making process in prioritizing their efforts to deal with energy problems. The science section contains science-related activities. Students will experience making fuel from grain and collecting the sun's energy.

Recommended Level

Grades 7-9

Academic Areas

Social Studies, Science

Time Required

General Section 8-9 days
Social Studies Section 4 days
Science Section 3-4 days

Process Skills

—Calculating
—Comparing
—Discussing
—Estimating
—Experimenting
—Graphing
—Identifying
—Listing
—Locating
—Researching
—Value-clarifying
—Writing

Advanced Teacher Preparation

Obtain: Energy films which may be applicable to a particular activity or unit.

The following are available:

NUCLEAR: "To Meet the Challenge" 16mm film. Available from:

Nebraska Public Power District
1414 15th St.
P.O. Box 499
Columbus, NE 68601
(402) 564-8561

GASOHOL: "Gasohol Continues to Grow" Slide Show (12 minutes).
Available from:

Ag. Products IVC
301 S. Centennial Mall
3rd Floor State Office Bldg.
Lincoln, NE 68509

Read: **Energy Info—A Directory of Publications and Audio Visual Material From the Nebraska Energy Office**

Goals

When students complete this packet, they should be able to make the following generalizations about energy:

1. Many energy sources we now depend upon are non-renewable.
2. Conservation of these resources is important.
3. The energy problem affects everyone.

Student Objectives

These are included previous to each activity.

Planning Guide (General Activities)

Day 1
Activity #1 "How Nebraska Uses Energy"
Day 2
Activity #2 "Energy Inventory"
Day 3
Activity #3 "What Do We Use for Energy?"
Day 4
Activity #4 "Past, Present, and Future—The Energy Picture"
Day 5
Activity #5 "Common Home Appliances and Energy Consumption Data"
Day 6
Activity #6 "$25.00 Limit"
Day 7
Activity #7 "Insulation Makes a Difference"
Day 8
Activity #8 "It's Everyone's Job"
Day 9
Activity #9 "Energy Glossary Completion"

Social Studies Section

Day 1
Activity #1 "A Day Without Energy"
Day 2
Activity #2 "Your Energy Decisions"
Day 3
Activity #3 "Unscramble These Sentences"
Day 4
Activity #4 "Public Attitudes Influence Cpnsumer Products"

Science Section

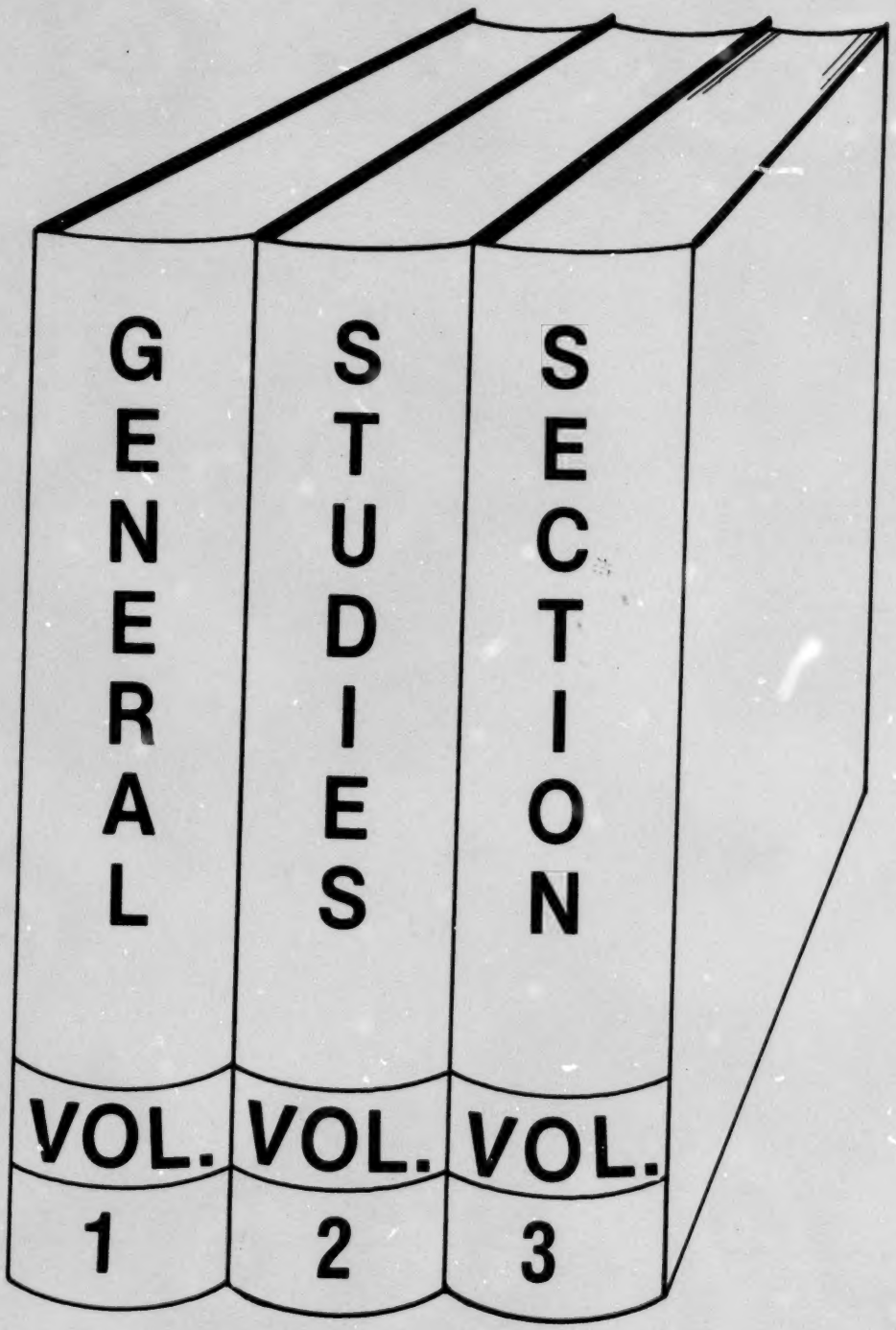
Day 1
Activity #1 "Energy Technology Review"
Day 2
Activity #2 "Gas From Grain"
Day 3
Activity #3 "Collecting the Sun's Energy"

Evaluation Suggestions

Evaluation of these units depends on how each activity is used and is therefore up to the individual teacher. As a suggestion, however, each student could take the energy inventory at the end of the unit and compare the results with the answers given on the inventory at the beginning of the unit.

Possible questions to be used as a part of the evaluation:

1) How did you feel toward saving energy when you started this unit? How has it changed?
2) What have you done to help conserve energy? What are your future plans?
3) Explain how your values influence the amount of energy you use.
4) Why is it important to save or conserve energy?
5) Who appears to use the most energy in your home? What have you done to help them reduce the amount of energy they use?


GENERAL
VOL. 1
STUDIES
VOL. 2
SECTION
VOL. 3

Instructor Information...

General Activity #1

"How Nebraska Uses Energy"

Rationale:

This activity illustrates how energy is used throughout all sectors of Nebraska society. The pyramid shows energy use increase in proportion to energy users. The category "Electric Utilities" means the energy the utility companies use in making electricity for their customers.

Student Objectives:

Students will be able to identify examples of each category of energy use: agricultural, industrial, residential, transportation, electric utilities.

Students will be able to identify the largest user of energy.

Students will be able to list examples of how energy is used at home, commercially, and agriculturally.

Implementation:

Each student is given the handout "How Nebraska Uses Energy". It may be necessary to explain each of the categories orally and have students give examples of each category. Then have students complete the worksheet.

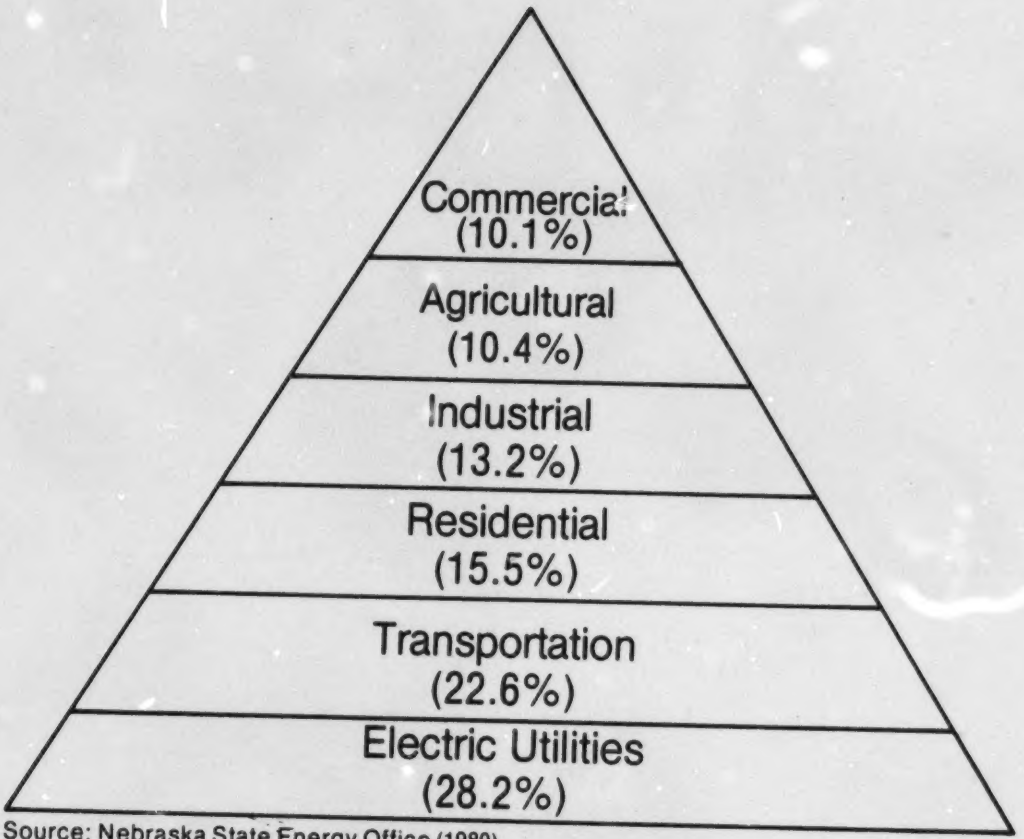
Debriefing:

After most students finish the activity sheet, discuss questions 3, 4, and 5 in general class discussion.

Name _____

Date _____

How Nebraska Uses Energy
Worksheet, Page 1



Source: Nebraska State Energy Office (1980)

How Nebraska Uses Energy

Name _____

Date _____

1. This illustration divides energy use in Nebraska into six areas. What area uses the most energy?

   _____

2. Rank the other areas (in order) from largest user to smallest user.

   A. Electric Utilities _____ 28.2%

   B. _____

   C. _____

   D. _____

   E. _____

   F. _____

3. From the graph, you can see that Nebraskans use much of the energy in their homes. List two ways you use energy at home.

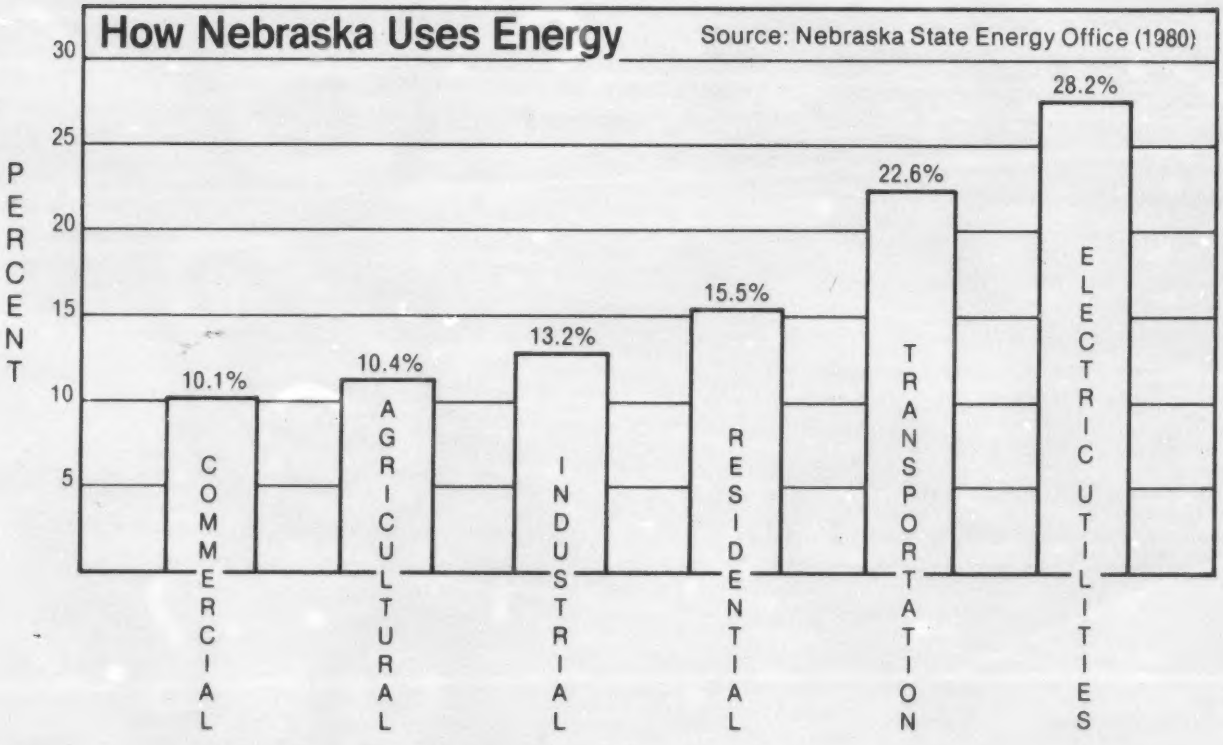
   A. _____ B. _____

4. List two ways commercial areas can save energy.

   A. _____ B. _____

5. What is one way Agriculture uses energy?

   _____



Instructor Information...

General Activity #2

"Energy Inventory"

Rationale:

The "Energy Inventory" is an activity designed to allow students to examine some of their own attitudes about energy and its use. The activity also allows students the opportunity to state their opinions concerning their role in the energy picture, that of big business, and the government's role in energy.

Student Objectives:

Students will be able to state whether they "agree", "don't know", or "disagree" with the statements concerning energy issues.

Students will be able to orally discuss reasons for their positions.

Implementation:

Make one copy per student of the energy inventory. Have students complete the inventory and discuss their reasons for choices through class discussion. (Optional) Make a transparency for each class, tally class results, and discuss areas of greatest difference.

Debriefing:

It is important to get students to present rational reasons for their choices. It is the responsibility of the teacher to question students concerning their choices. **No grades** should be given on this worksheet.

Name _____

Date _____

Energy Inventory
Worksheet, Page 1

This is not a test.

This is not a test.

The following statements are designed to help you determine what you know about energy and to help you examine some of the attitudes you have toward energy use. **You will not be graded** on this inventory because, for many of the statements, there are no "right" answers; it is simply a matter of what you think or feel.

Directions: Read each statement and decide whether you "agree" with the statement, "disagree" with the statement, or "don't know". Check one response for each statement.

	Agree	Don't Know	Disagree
1. Industries should pay higher prices per unit of energy than anyone else.			
2. We should use more wood to reduce our use of coal and oil.			
3. The government should give a tax break to people who drive small cars.			
4. Most people would reduce the amount of energy they use if the price were twice as high.			
5. To save energy, I would be willing to buy a "black and white" instead of a "color" television set.			
6. As long as other people are driving big cars, my family should, too.			

Name _____

Energy Inventory
Worksheet, Page 2

Date _____

	Agree	Don't Know	Disagree
7. Citizens of the U.S. will never volunteer to reduce the amount of energy they use.			
8. Although gasoline prices are high now, they will get lower in the future.			
9. I want a car of my own.			
10. Most people think that the whole gasoline shortage problem was something the oil companies created to increase their profits.			
11. If bus service were available, I'd be willing to use a bus rather than a car to get around town.			
12. People get more colds when their homes are heated to 68°F than when their homes are heated to 72°F.			
13. Research and new inventions will solve our energy problems before fossil fuels run out.			
14. Even though American cars use more gas, they are built better and last longer than foreign cars.			
15. Hanging clothes out to dry is more sensible than using a gas or electric dryer.			
16. If worst comes to worst, I can get along without any energy.			
17. Reducing the amount of energy we use will not necessarily reduce our quality of life.			

Name _____

Date _____

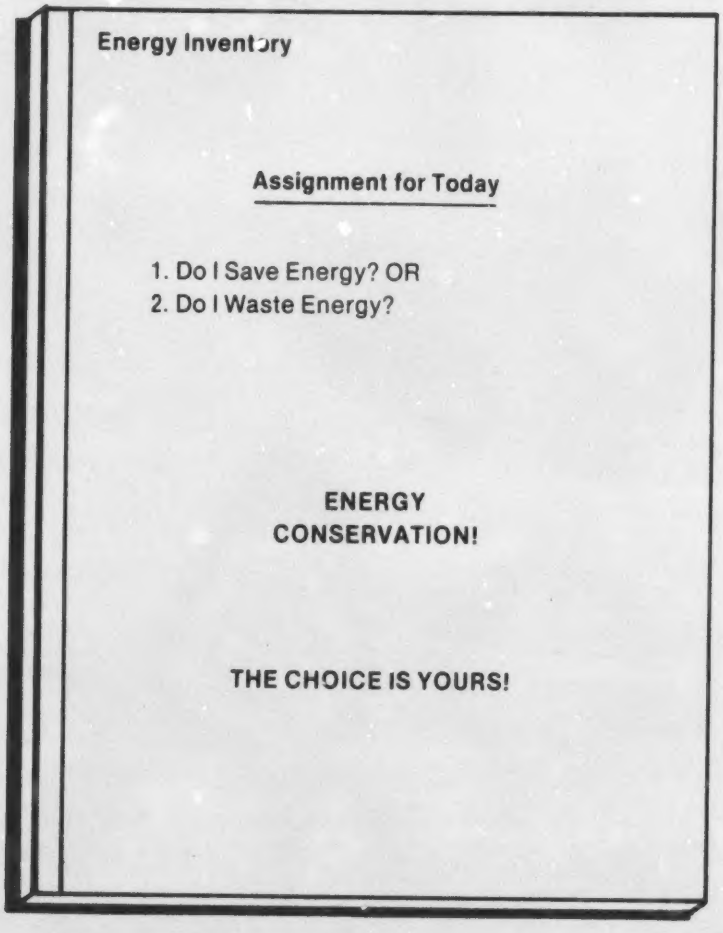
Energy Inventory
Worksheet, Page 3

	Agree	Don't Know	Disagree
18. Buying more material things than we need is a major cause of our energy shortage.			
19. Hot showers use less energy than hot baths.			
20. We should pass a law that allows a family to have no more than two cars.			
21. The cost of maintaining natural systems such as national parks isn't worth the benefit.			
22. The way I personally use energy doesn't make much difference in the total energy use picture.			
23. The price of petroleum affects the cost of most other things we buy.			
24. Nuclear energy is a clean, safe way to produce unlimited supplies of energy.			
25. When we run out of fossil fuels, we'll switch to electricity.			
26. I would ride my bike or walk rather than ride in a car if it helped save energy.			
27. I would be willing to attend football games right after school rather than at night to save lighting energy.			

Name _____

Date _____

	Agree	Don't Know	Disagree
28. I would not really change the way I do things just to help save energy.			
29. My individual efforts can help solve the energy problem.			
30. Energy conservation is one of the most important objectives of my generation.			



Instructor Information...

General Activity #3

"What Do We Use For Energy?"

Rationale:

Two pie graphs are utilized in this particular activity. They illustrate how Nebraska uses energy as compared to how the United States uses energy. These graphs allow students to begin to analyze data and draw some conclusions on both state and national levels.

Student Objectives:

Students will be able to answer questions concerning both graphs.

Students will be able to identify energy sources which will increase/decrease in the future.

Students will be able to compare energy sources used in Nebraska with those used in the United States.

Implementation:

Each student is given a "What Do We Use For Energy" worksheet. Explain the two graphs as a breakdown by fuel types of energy consumption in the U.S. and in Nebraska. If students are not familiar with pie graphs, you may wish to explain how to interpret the graphs. Students should complete the worksheet in pairs or on their own. **Optional**: This could be done as a total class activity.

Debriefing:

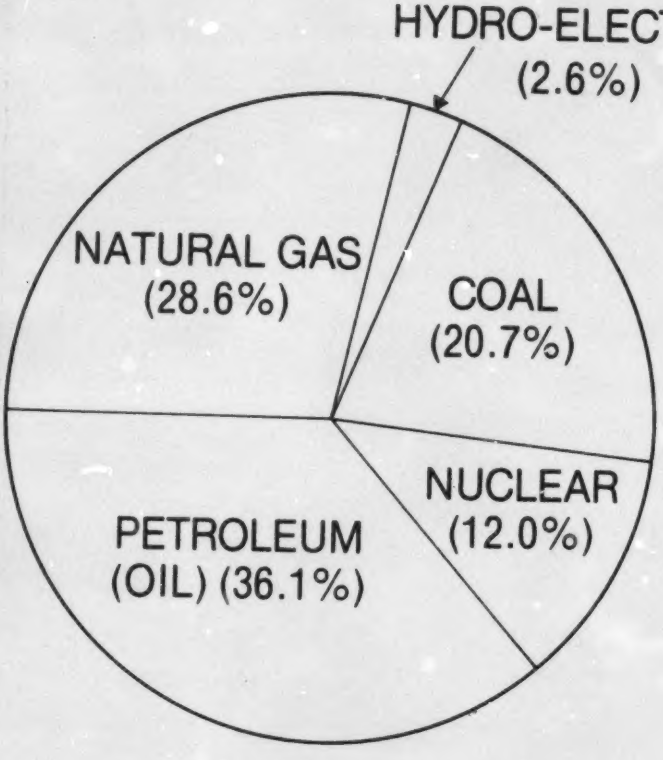
Some time should be spent on explaining fossil fuels. Questions 8, 9, and 10 will have several different answers which will be worth discussing in detail. Attempt to get students to discover the fact that Nebraska and the United States are dependent on fossil fuels.

Name _____

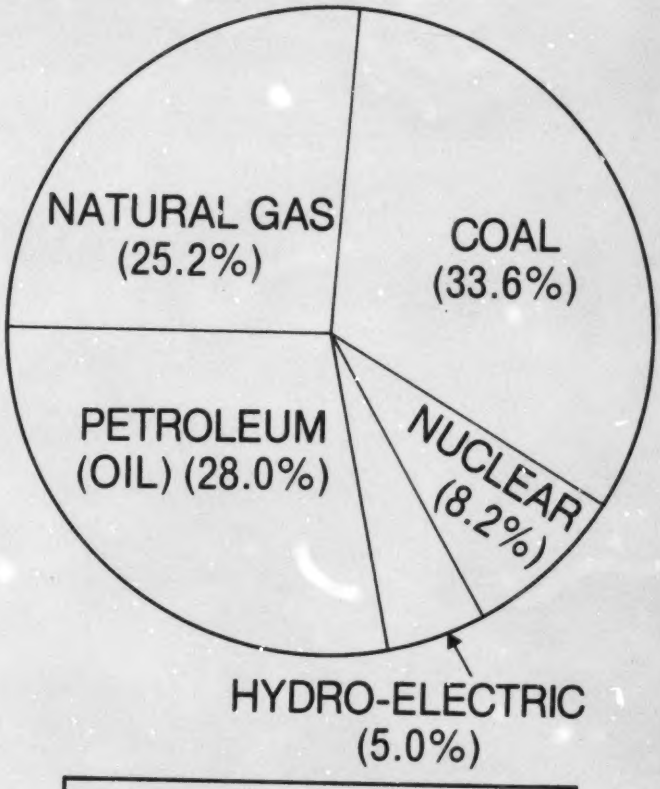
Date _____

What Do We Use For Energy?

Worksheet, Page 1



NEBRASKA ENERGY*



U.S. ENERGY**

*NEBRASKA ENERGY OFFICE, 1980

**U.S. DEPARTMENT OF ENERGY, 1980

Name _____

Date _____

What Do We Use For Energy?
Worksheet, Page 2

Directions: Using the pie graphs answer the following questions:

1. What energy source is most used in Nebraska?

   _____

2. What energy source is most used in the U.S.?

   _____

Directions: Complete the columns below listing (in order) from **largest** to **smallest**, the types of energy used in **Nebraska and in the U.S.**

Nebraska	%	United States	%
1. _____	_____	1. _____	_____
2. _____	_____	2. _____	_____
3. _____	_____	3. _____	_____
4. _____	_____	4. _____	_____
5. _____	_____	5. _____	_____

3. Compare the two graphs. Which uses a greater percentage of nuclear energy, the United States or Nebraska?

   _____

4. Compare the two graphs. The United States uses coal for 33.6% of its energy. What percentage of Nebraska's energy is developed from coal?

   _____

5. The smallest share of energy used in Nebraska is from _____.

6. What is meant by "hydroelectric power"? _____

   _____

   _____

Name _____

Date _____

What Do We Use For Energy?
Worksheet, Page 3

7. A **fossil fuel** is any fuel formed from the decayed material of plants and animals over millions of years under particular conditions of temperature and pressure. Of the five major sources of energy we have studied in these two graphs, which sources come from fossil fuels?

_____

_____

_____

8. Would you say the United States is **dependent** upon or **independent** of fossil fuels for energy? (Check the correct answer)

☐ dependent

☐ independent

9. Would you say Nebraska is **dependent** upon or **independent** of fossil fuels for energy? (Check the correct answer)

☐ dependent

☐ independent

10. Which energy sources will probably **increase** in use (in the future)?

_____ Why is this likely? _____

_____

11. Which energy sources will probably **decrease** in use (in the future)?

_____ Why is this likely? _____

_____

12. What kinds of problems might occur with an increased use of coal?

_____

_____

_____

Instructor Information...

General Activity #4

"Past, Present, and Future—The Energy Picture"

Rationale:

The illustration on the student worksheet is a graph of the history of energy use in the United States from 1850-2020. This visual display shows the dramatic change from one type of energy source to another.

Student Objectives:

Students will be able to identify major sources of energy used at particular times throughout history.

Students will be able to discover differences between this graph and pie graphs.

Students will be able to explain why sources of energy continue to change.

Implementation:

Each student should be given the worksheet "Past, Present, and Future—The Energy Picture". Again, spend time explaining the graph as well as comparing it to previous graphs studied. Students can then complete the activity.

Debriefing:

Question #6 could be used for class discussion. You may have students identify which sources are renewable sources. **Optional**: Have students use the information from the graph to make a different type of display, such as a pie graph.

Name _____

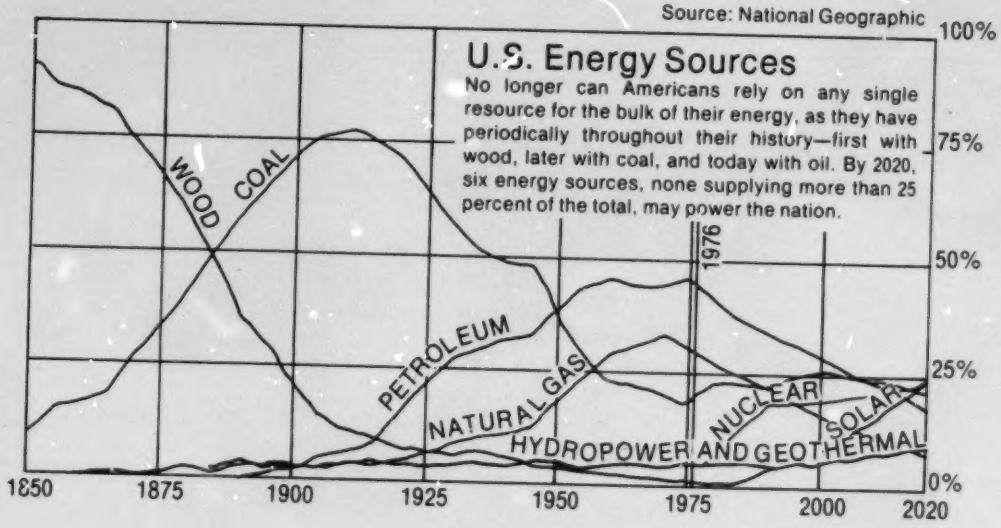
Date _____

Past, Present, and Future—The Energy Picture

Worksheet, Page 1

Past, Present, And Future: The Energy Picture

Source: National Geographic



1. In 1850, what was the major source of energy used in the U.S.?

   _____

2. When did the use of coal as an energy source in the U.S. reach its highest percentage level?

   _____

3. In 1960, what was the major source used in the U.S.?

   _____

Name _____

Date _____

Past, Present, and Future—The Energy Picture
Worksheet, Page 2

4. In 1976, what were the six sources of energy used in the U.S.? **Please list them (in order) from highest use to lowest use.**

   1. _____
   2. _____
   3. _____
   4. _____
   5. _____
   6. _____

Does this list look familiar? The **pie graph** on energy sources which we studied earlier, gives you the same information as this **line graph**.

5. What is the difference between this line graph and the pie graph you did earlier?

   _____

   _____

6. This line graph predicts that by the year 2020, four of the energy sources will be used almost equally in the United States. What are these four sources?

   _____

   _____

7. What is the major energy source predicted for the year 1985?

   _____

8. What is meant by "hydropower" and "geothermal energy"?

   _____

9. Why can't solar energy be used for 100% of our energy needs?

   _____

10. Why did an energy source such as wood, fall to such a low level of use by 1975?

    _____

    _____

Instructor Information...

General Activity #5

"Common Home Appliances and Energy Comsumption Data"

Rationale:

Students have a better understanding of energy usage when they can **apply** knowledge. This activity, aids students in examining home appliances and the amount of energy they use.

Student Objectives:

Students will determine how much electrical energy their family consumes in one month.

Students will be able to gather home appliance energy usage information.

Students will be able to determine a monthly cost of energy use for their homes.

Implementation:

It is important that you contact your local power company for the current cost of a kilowatt hour. This rate changes frequently and some cost adjustments may be necessary. The following chart is based on 1981 Lincoln residential summer rates.

Hand out to students an "Estimated Energy Requirements for Electric Appliances" worksheet. Also, give students a "personal" worksheet so they can record personal data. Students may be able to begin working on this activity **in class** but may need to complete them at home.

Debriefing:

The "Questions Worksheet" will stimulate additional discussion. Question #2 will get students to begin to prioritize their needs. (They may use the "Estimated Energy Requirements for Electric Appliances" information sheet.)

Name _____

Date _____

General Activity #5
Handout, Page 1

Estimated Energy Requirements For Electric Household Appliances

Comfort/Conditioning	Ave. KWH Per Month	Ave. Cost Per Month	Ave. Cost Per Hour
Air Cleaner	18	$ .84	.2¢
Blanket	21	$ .96	.8¢
Dehumidifier	64	$2.98	1.2¢
Fan, Ceiling Mounted (Attic)	111	$6.75	2.3¢
Fan, Circulating	26	$1.58	.5¢
Fan, Window	60	$3.65	1.2¢
Space Heater (portable)	66	$3.08	6.0¢
Heating Pad	.8	$ .037	.3¢
Humidifier	27	$1.26	.8¢
Quartz Heater*			
High Setting			6.5¢
Low Setting			3.2¢
Furnace Fan**			
¼ HP			1.7¢
⅓ HP			2.3¢
½ HP			3.5¢
Air Conditioning			
12,000 BTU (1 ton or 2.1 KW)			12.8¢
18,000 BTU (1½ ton or 2.9 KW)		17.7¢	
24,000 BTU (2 ton or 3.7 KW)			22.5¢
36,000 BTU (3 ton or 5.4 KW)			32.9¢
Food Preservation			
Freezer			
15 cu. ft. upright	100	$4.66	1.5¢
15 cu. ft. upright frostless	147	$6.85	2.0¢
Refrigerator/Freezer			
15 cu. ft.	95	$4.43	1.5¢
15 cu. ft. frostless	153	$7.13	2.8¢

*Number of hours used varies widely

**Furnace fan figured at 746 watts per HP, operating at an efficiency rate of 50%

Name _____

Date _____

General Activity #5
Handout, Page 2

Estimated Energy Requirements For Electric Household Appliances

Food Preparation	Ave. KWH Per Month	Ave. Cost Per Month	Ave. Cost Per Hour
Coffee Maker (Drip)	8.9	$ .41	4.1¢
Electric Frying Pan	15.5	$ .72	5.6¢
Garbage Disposal	2.7	$ .13	2.0¢
Mixer (hand)	.13	$ .06	.6¢
Microwave	16.5	$ .77	7.0¢
Toaster	3.4	$ .16	5.3¢
Toaster-Oven			
Toasting	3.0	$ .14	7.0¢
Broiler	5.0	$ .23	3.9¢
Oven	16.5	$ .77	7.0¢
Range			
Bake	22.6	$ 1.05	13.2¢
Broil	17.4	$ .81	13.5¢
Surface Units			
6" unit, high setting			6.5¢
8" unit, high setting			21.1¢
Slow Cooker	11.4	$ .53	.9¢
Utility			
Clock	1.46	$ .07	--
Fluorescent light (40W)	3.68	$ .17	.2¢
Fluorescent light (20W)	1.84	$ .09	.1¢
Incandescent light (100W)	9.2	$ .43	.5¢
Sewing Machine	.9	$ .04	.3¢
Vacuum Cleaner	3.8	$ .18	2.9¢
Iron	13	$ .61	5.1¢
Dishwasher	30	$ 1.40	5.6¢
Washing Machine (automatic)	9	$ .42	2.4¢
Dryer	83	$ 3.87	22.6¢
Water Heater	500	$23.30	21.0¢
Water Bed (King Size)			
(Operating 50% of time)	120	$ 5.60	01.7¢
Home Entertainment			
Radio	7.2	$ .34	.34¢
Stereo	10	$ .47	.47¢
Television (19 inch)			
B & W (tube type)	12	$ .56	.47¢
B & W (solid state)	5.4	$ .25	.21¢
Color (tube type)	28.8	$ 1.34	1.10¢
Color (solid state)	17.4	$ .81	.68¢

Name _____

Date _____

General Activity #5
Handout, Page 3

Estimated Energy Requirements For Electric Household Appliances

Health & Beauty	Ave. KWH Per Month	Ave. Cost Per Month	Ave. Cost Per Hour
Curling Iron	.2	$ .01	.19¢
Hairdryer (hand held)	4	$ .19	4.7¢
Hair setter/curlers	1	$ .05	1.6¢
Shaver	.03	$ .001	---
Heat Lamp	1	$ .05	1.2¢

Operating costs were figured on the average residential rate of 4.66¢ per KWH for 1981.

Summer rates of 6.09¢ per KW were used for air conditioners and fans, which is the summer rate for 1981.

To calculate operating costs of any electric appliance:

wattage X hours of use ÷ 1000 = kwh
kwh X rate = average operating cost

ESTIMATED ENERGY REQUIREMENTS FOR ELECTRIC APPLIANCES

Name _____

Date _____

Common Home Appliances and Energy Consumption Data
Personal Worksheet

Directions: Write down the appliances which you have in your home. Then write the monthly KWH (kilowatt hour) consumption number next to each item. Remember—if you have two of something, double the KWH.

	Appliance	Monthly KWH Consumption	Monthly Cost
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
		Total	

Extra! Extra! Check your electric bill at home and see if you were close to predicting the actual cost for one month.

Name _____

Date _____

Common Home Appliances and Energy Consumption Data
Questions Worksheet

1. What appliances use the most energy? Are they necessities or luxuries? Are they for comfort or survival? Explain your answers!

2. If energy consumption was cut, which appliances would probably be first to go? Explain your answers!

Instructor Information...

General Activity #6

"$25.00 Limit"

Rationale:

This activity is a continuation of activity number five. Students have to decide what appliances they would keep and operate within their $25.00 limit. This allows students to begin to discover those appliances which are most necessary.

Student Objectives:

Students will choose items most important to them.

Students will total up their cost per month **equal to $25.00 or less.**

Students will be able to support their choices through oral discussion.

Implementation:

Hand out the "$25.00 Limit" worksheet and an "Estimated Energy Requirements for Electric Appliances" information sheet (see activity #5). Instruct students to select those appliances most important to them and write them down (as well as their cost per month). They should add up the cost of all their choices and this should equal $25.00, or less.

Debriefing:

It may be advantageous to have students work on their selections individually, then discuss those selections in small groups or as a class. Throughout the discussion an emphasis should be placed on **reasons** for their choices rather than the **choices** themselves.

Name _____

Date _____

$25.00 Limit Worksheet

$25.00—

LIMIT

Directions: Using the "Estimated Energy Requirements for Electric Appliances" information sheet, choose the appliances you think you **must have**! You only have $25.00, so be careful in making your decisions.

	Type of Appliance	Cost Per Month
1.		$
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
15.		
	Total	$

Instructor Information...

General Activity #7

"Insulation Makes a Difference"

Rationale:

Heating and cooling costs can be cut considerably by insulating. Houses without insulation are wasting precious energy which could be used for other purposes. (This is an additional method for saving money and energy).

Student Objectives:

Students will be able to compare energy savings made by insulating homes.

Students will be able to make a graph from the information given.

Students will be able to interpret graphic data results.

Implementation:

Hand out the "Insulation Makes a Difference" worksheets.
Discuss information on both sheets. Make sure students understand they are to graph both sets of figures—those before insulating, and those after insulating. Students should use a different color for each graph line, so they do not become confused as to which line represents **before** and **after** data.
Have students answer questions about the completed graph.

Debriefing:

As students begin plotting their graph lines, check to make sure they are doing them correctly. This is an important part of the graphing skill. During discussion, you may want to choose particular months for a comparison of costs.

Name _____

Date _____

Worksheet Introduction

Insulation Makes a Difference

Below are a family's heating and air conditioning bills for two different years. The first set of data shows little or no insulation in the home. Then they had some insulation installed, and the cost of heating and cooling their home went down. In the graph, place a dot for the cost of each month's energy use before insulation. Do the same thing with the monthly data after insulation has been added. You may want to use a different color for the second line. Compare the family's cost for energy before and after insulating.

How much did they save in January? _____

How much did they save for the entire year? _____

Month	Before Insulating	After Insulating
1. January	$150.00	$120.00
2. February	125.00	100.00
3. March	100.00	80.00
4. April	50.00	40.00
5. May	15.00	12.00
6. June	50.00	40.00
7. July	70.00	56.00
8. August	80.00	64.00
9. September	15.00	12.00
10. October	30.00	24.00
11. November	100.00	80.00
12. December	125.00	100.00

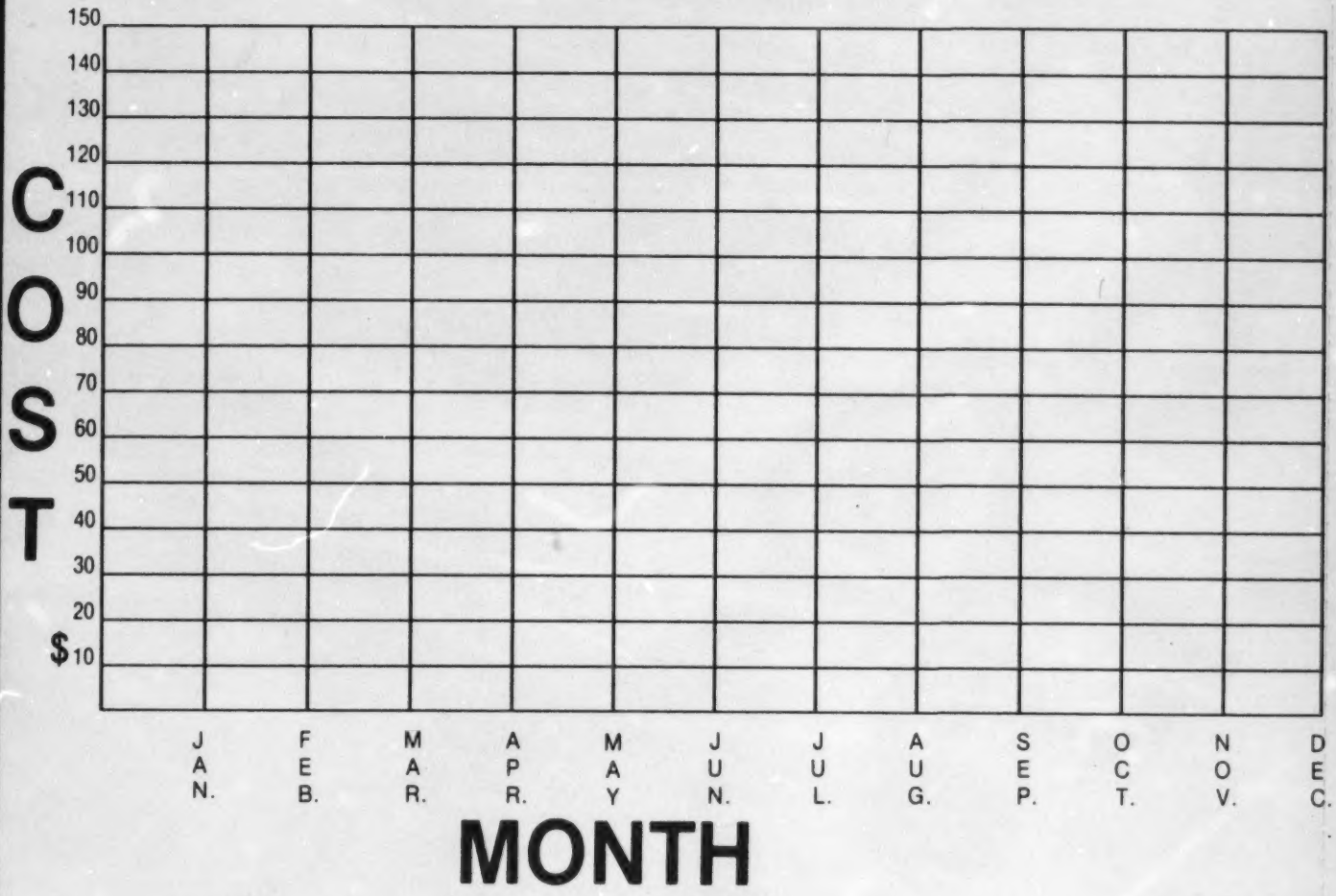
Name _____

Insulation Makes A Difference

Date _____

Worksheet, Page 1

Monthly Heating and Cooling Costs BEFORE and AFTER Insulating



1. At what time(s) of the year is (are) the greatest savings **after** insulation?

_____

2. At what time(s) of the year is (are) the **highest** utility costs?

_____

Instructor Information...

General Activity #8

"It's Everyone's Job"

Rationale:

It is easy for students to talk about energy and conservation practices. It is more difficult to actually come up with practical conservation measures. This activity attempts to allow students to identify energy resources which can be saved. It also directs them to identify ways of encouraging conservation.

Student Objectives:

Students will be able to identify energy resources.

Students will be able to suggest, in writing, ways to conserve energy.

Implementation:

Give each student an "It's Everyone's Job" worksheet. Read through the directions as well as the first example. Have students complete the remainder of the activity. This activity can be done individually, or in small groups.

Debriefing:

If desired, this worksheet can be discussed after completion.

Name _____

Date _____

It's Everyone's Job!!!

Worksheet

Directions: It's Everyone's Job!!! Read the idea for conserving energy in the column headed CONSERVATION METHODS. Then, answer the questions in the spaces provided. The first one is done for you.

CONSERVATION METHODS	What energy resources does this save?	How can we encourage this conservation method?
1. Riding bicycles when traveling around town.	Petroleum	1. Request more and better bike paths to be made through the city.
2. Shipping freight by train instead of truck.	_____	2. _____
3. Replacing incandescent light bulbs with fluorescent lights.	_____	3. _____
4. Reducing heating and cooling where space is unoccupied.	_____	4. _____
5. Recycling steel, paper, glass, and aluminum.	_____	5. _____
6. Developing and using mass transit systems.	_____	6. _____

Instructor Information...

General Activity #9

"Energy Glossary Completion"

Rationale:

Energy terminology can be difficult. If students have a purpose for using the glossary, they are likely to refer to it more often. This activity attempts to involve students with the glossary and at the same time, complete a worksheet activity.

Student Objectives:

Students will be able to locate specific vocabulary terms with the use of the glossary.

Students will complete vocabulary words having been given the first letter of the term.

Implementation:

Hand out an "Energy Glossary Completion" worksheet. Explain to students, they are to use the glossary to find the required word answers. There are three words needed to complete the activity which are not a part of the glosssary. There are clues given, however, for each part (A and B).

Debriefing:

Students can check their own work or you may collect and check it.

Name _____

Date _____

Energy Glossary Completion
Worksheet

Directions: Use the "Energy Glossary" to complete each word using the hints below. The first letter of each word is provided.

Part A.
1. C _____ _____
2. O _____ _____
3. N _____ _____
4. S _____ _____
5. E _____
6. R _____
7. V _____ (not in glossary)
8. E _____

Part B.
1. E _____
2. N _____ _____
3. E _____ (not in glossary)
4. R _____ _____
5. G _____
6. Y _____ (not in glossary)

Clues:

Part A.
1. petroleum from the ground
2. shale rock that contains petroleum
3. a gaseous fuel often found with crude oil
4. sun energy
5. producing a desired effect with a minimum of effort
6. a part of a resource that hasn't been used yet
7. another word for **speed** of the wind (not in glossary)
8. ability to do work

Part B.
1. ability to produce an effect with a minimum of effort
2. energy produced by splitting atoms
3. power used to light houses (not in glossary)
4. resources which can be reproduced
5. a mixture of 90% unleaded gasoline and 10% anhydrous grain alcohol
6. Who can influence the saving of energy? (not is glossary)

Name _____

Energy Glossary

Date _____

1. **atom** the basic building block of all matter, the smallest particle of a chemical element that still has the properties of that element.

2. **barrel** a commonly used measurement for oil. It equals 42 gallons. One barrel of crude oil has the same energy as 350 pounds of coal.

3. **BBD** abbreviation for billion barrels per day.

4. **biomass** any renewable plant material that can be used to generate energy. Examples include: algae, silage, wood, and fermentable grains.

5. **breeder reactor** a nuclear reactor that makes more nuclear fuel than it uses, by changing certain atoms that will not split into atoms that will split.

6. **BTU** abbreviation for British Thermal Unit. This is the amount of heat necessary to raise the temperature of one pound of water 1 degree Fahrenheit.

7. **calorie** a metric unit of heat energy. This is the amount of heat necessary to raise the temperature of one kilogram of water 1 degree Celsius.

8. **chain reaction** a reaction that stimulates its own repetition. Example: fission

9. **coal** a solid fuel, mostly formed from the fossils of plants living hundreds of millions of years ago.

10. **conservation of energy** more efficient use of both existing and new sources of energy.

11. **crude oil** petroleum as it comes from the ground. It is formed from the fossils of animals and plants at the bottom of ancient seas.

12. **deep mining** mining that must be performed by digging underground shafts and tunnels.

13. **depletion allowance** a tax reduction granted to companies engaged in extracting oil, natural gas, and other minerals. It is based on the idea that these resources are exhaustible and, therefore, the companies are depleting their own sources of future income.

14. **efficiency** the ability to produce a desired effect with a minimum of effort, expense, or waste.

15. **energy** the ability to do work. Work, in this sense, is any change in the state of an object.

16. **fly ash** tiny particles of solid ash found in smoke when fuels such as coal are burned.

17. **fluorescent** able to glow with visible light when hit by ultraviolet or other radiations.

18. **First Law of Thermodynamics** Energy can be neither created nor destroyed.

19. **fission (nuclear)** the splitting of the nucleus or center of one atom into two or more smaller atoms. Fission often releases large quantities of energy.

20. **fossil fuel** any fuel formed from the fossils of plants and animals. Examples are: coal, petroleum, and natural gas.

21. **fuel** any material burned to supply heat or power.

22. **fuel oil** a refined petroleum product.

23. **fusion (nuclear)** the process of combining the nuclei or centers of two light atoms to form a heavier atom. Fusion can release great quantities of energy. The sun produces its energy by fusion.

24. **gasohol** a mixture of 90% unleaded gasoline and 10% anhydrous grain alcohol.

25. **geothermal energy** heat energy in the earth's crust whose source is the earth's molten interior.

26. **hydroelectric plant** an electrical power plant in which the energy of falling water is converted to electrical energy by a turbine generator.

27. **incandescent** glowing hot enough to give off light.

28. **kilowatt** a unit of electric power (1000 watts) indicating the rate at which electrical energy is being produced or consumed.

29. **mass transit** any form of public transportation that carries large numbers of people.

30. **MBD** abbreviation for million barrels per day.

31. **natural gas** a gaseous fuel formed from the fossils of ancient plants and animals. This gas is often found with crude oil.

32. **nuclear power** The energy produced by splitting atoms (such as uranium) in a nuclear reactor

33. **nuclear reactor** fissionable fuel assembled and arranged to sustain a fission (atom-splitting) chain reaction.

34. **nuclear waste** used fuel from a nuclear reactor. This used fuel is highly radioactive.

35. **oil** the term commonly used for the liquid form of petroleum.

36. **oil shale** a deposit of shale rock that contains petroleum.

37. **OPEC** abbreviation for the Organization of Petroleum Exporting Countries. These countries are mainly from the Middle East and Africa. These nations produce more than half of the world's oil, and supply about 85% of the oil imported by non-member nations. OPEC has a major influence on petroleum pricing and supply.

38. **petroleum** fuel formed by the fossil remains of plants and animals.

39. **primary energy source** a source of energy that can be used in its naturally occuring form. Examples include coal, uranium and oil. These fuels do not have to be converted to another form before they can be used.

40. **radioactivity** a spontaneous change in the nucleus or center of an atom, accompanied by the release of energy called nuclear radiation.

41. **renewable resources** resources that will not be depleted after use either because they are constantly available (such as sunlight, wind or water flow) or because they can be reproduced (such as wood).

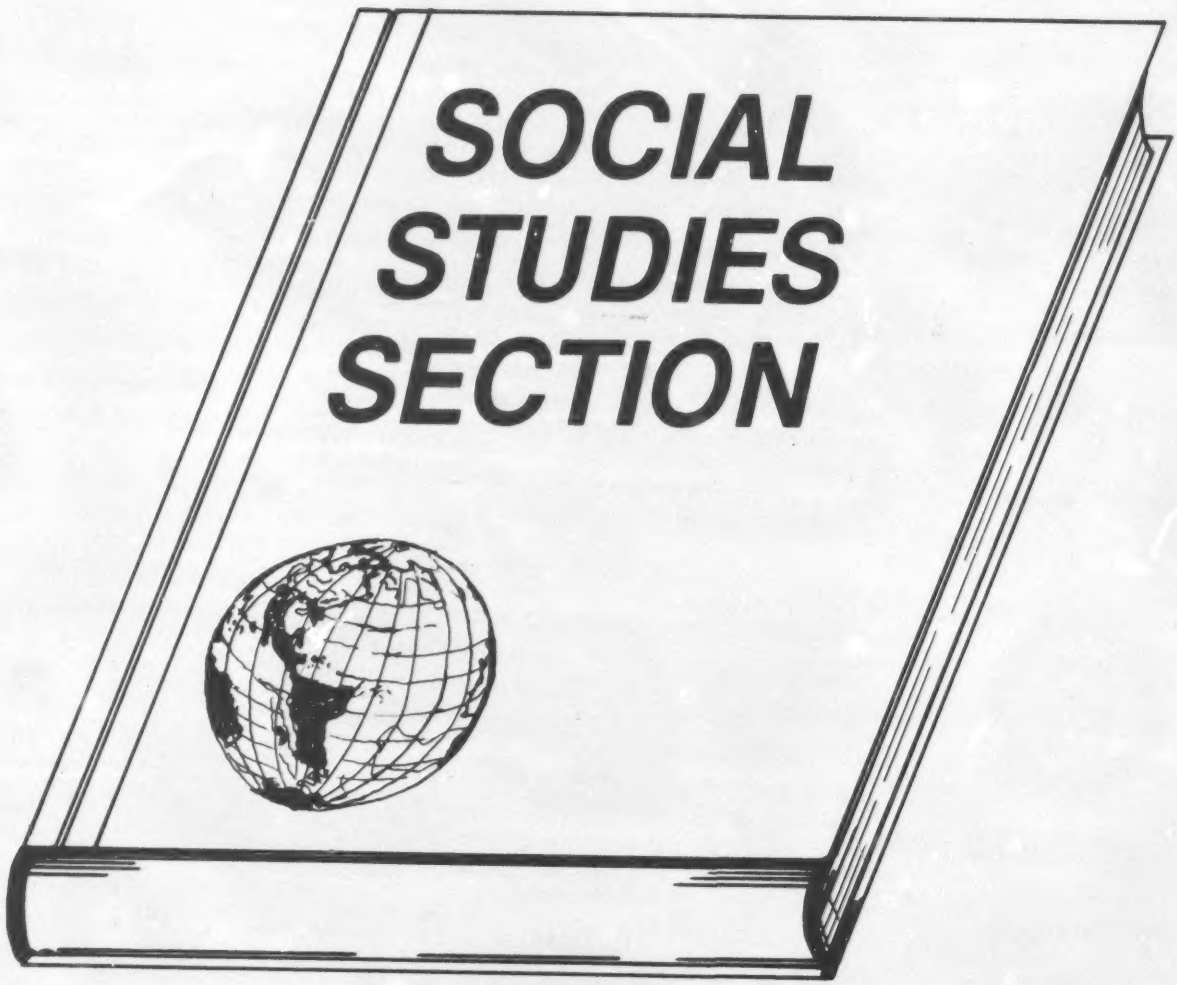
42. **reserve** the portion of a resource that has been actually discovered, not yet used, and which is presently, technically, and economically extractable.

43. **solar energy** energy received from the sun. NOTE: Nuclear and geothermal are the only presently available energy forms not derived from the sun.

44. **solid waste** all useless, unused, unwanted or discarded solid materials.

45. **strip mining** mining for coal or useful ores by removing the soil and rock found above them, rather than by tunneling underground.

46. **wind energy** power generated from a rotor blade pushed by winds.


SOCIAL
STUDIES
SECTION

Instructor Information...

Social Studies Activities #1-4

Rationale:

Students may feel they don't have to worry about some types of energy in their everyday experiences. "A Day Without Energy" asks students to examine the everyday use of energy. Through other activities, students are asked to use rational decision-making processes to prioritize items of personal importance. They can also investigate how public attitudes can influence and change consumer products as well as change people. These activities attempt to get students "actively" involved in **confronting** the energy problem. They are Social Science activities which build on and supplement the **General** activities.

Student Objectives:

Students will be able to examine the energy used in a single day.

Students will be able to make rational decisions concerning their energy priorities.

Students will be able to unscramble sentences concerning energy.

Students will be able to examine some aspect of advertisements and their influence on consumer products.

Implementation:

Activity #1

Hand out "A Day Without Energy" worksheets. Explain to students that this will be a day in which no energy is used. They must write down those things which they will **not** be able to do throughout their day. The "questions about your day" can be used in general class discussion.

Activity #2

Hand out "Your Energy Decisions" worksheets. Then divide the class into groups of 4-5. Read instructions to the class and have them attempt to reach group consensus through discussion. As a total class, explain some of the difficulties in reaching a consensus because of individual values and opinions.

Instructor Information...

Activity #3

Hand out "Unscramble these Sentences" worksheets. Students can complete this activity on their own. Go over the worksheet as a total class. You may want to explain some or all of the statements.

Activity #4

This activity involves some intensive research. Students and teachers may have to locate information from several different sources. Hand out "Public Attitudes Influence Consumer Products" worksheets. Read directions (to students) explaining what they are to do. Students may want to use visual aids in support of their evidence.

Name _____

Date _____

A Day Without Energy

Social Studies Activity #1
Worksheet, Page 1

Directions: All the energy is gone!!! What will you do today???

What things will you **not** be able to do because you don't have energy?

Morning (you first get up)

At home
7:00 - 8:00 a.m. I won't be able to _____

_____

_____

Going to school
8:01 - 9:00 a.m. I won't be able to _____

_____

_____

9:01 - 3:00 p.m. I won't be able to _____

_____

_____

At lunch I won't be able to _____

_____

_____

In the evening
7:01 - 10:00 p.m. I won't be able to _____

_____

_____

Name _____

Date _____

A Day Without Energy
Social Studies Activity #1
Page 2

Questions About Your Day

1. At what times did you miss energy the most? _____

2. Early man had to find ways to get things done without electricity and gas. What are some things early man did to solve these problems?

   a. keep food cold

   b. keep dwelling warm

   c. travel from area to area

   d. make tools without manufacturing equipment

3. How are many things we do dependent upon energy? _____

4. Name one way you can save some energy today.

5. What energy source would you be saving? _____

Name _____

Date _____

Your Energy Decisions

Social Studies Activity #2
Worksheet

The President of the United States has just made an announcement on national television. He has commanded every man, woman, and child in the United States to decrease their energy use by 50 percent IMMEDIATELY!

Your survival depends on this reduction of energy. Your task is to rank the 14 items in terms of their importance. Place the number "1" by that item you would most like to keep. Place the number "2" by the second item you would most like to keep and so on. You must rank all of the items. This means items 8-13 would be those things you're willing to do without.

- ☐ 1. Outlaw all driving on weekends (Saturdays/Sundays).
- ☐ 2. Reduce speed limits to 45 miles per hour on interstates and highways.
- ☐ 3. Give up all Christmas lighting, indoor and outdoor.
- ☐ 4. Set thermostats at 55 degrees in winter.
- ☐ 5. Ban all vacation trips over 25 miles away.
- ☐ 5. Limit the use of electricity from 8:00 a.m. to 6:00 p.m.
- ☐ 7. Increase the cost of gasoline from $1.50 to $5.00 a gallon.
- ☐ 8. Shut down schools for one winter month: make up time during summer.
- ☐ 9. Allow each family only five gallons of gasoline per week.
- ☐ 10. Cut police and fire protection in half.
- ☐ 11. Outlaw the use of washers and dryers, dishwashers, garbage disposals, hair dryers, radios, televisions, stereos, and other luxury items.
- ☐ 12. Turn off all street and yard lights as well as advertising signs.
- ☐ 13. Cut down on bus and taxi transportation.

decisions decisions decisions

Name _____

Date _____

Unscramble These Sentences

Social Studies Activity #3
Worksheet

Directions: These sentences may be unscrambled individually or as a class activity. Rewrite them below.

1. dryer do overload not clothes.

_____

2. less water baths showers use than.

_____

3. rinse after air dry dishes in dishwasher the the.

_____

4. loads use full washing machine in.

_____

5. television turn when off not watched being.

_____

6. loads in dry clothes consecutive.

_____

7. can save carpools gasoline.

_____

8. can help I save energy.

_____

Name _____

Date _____

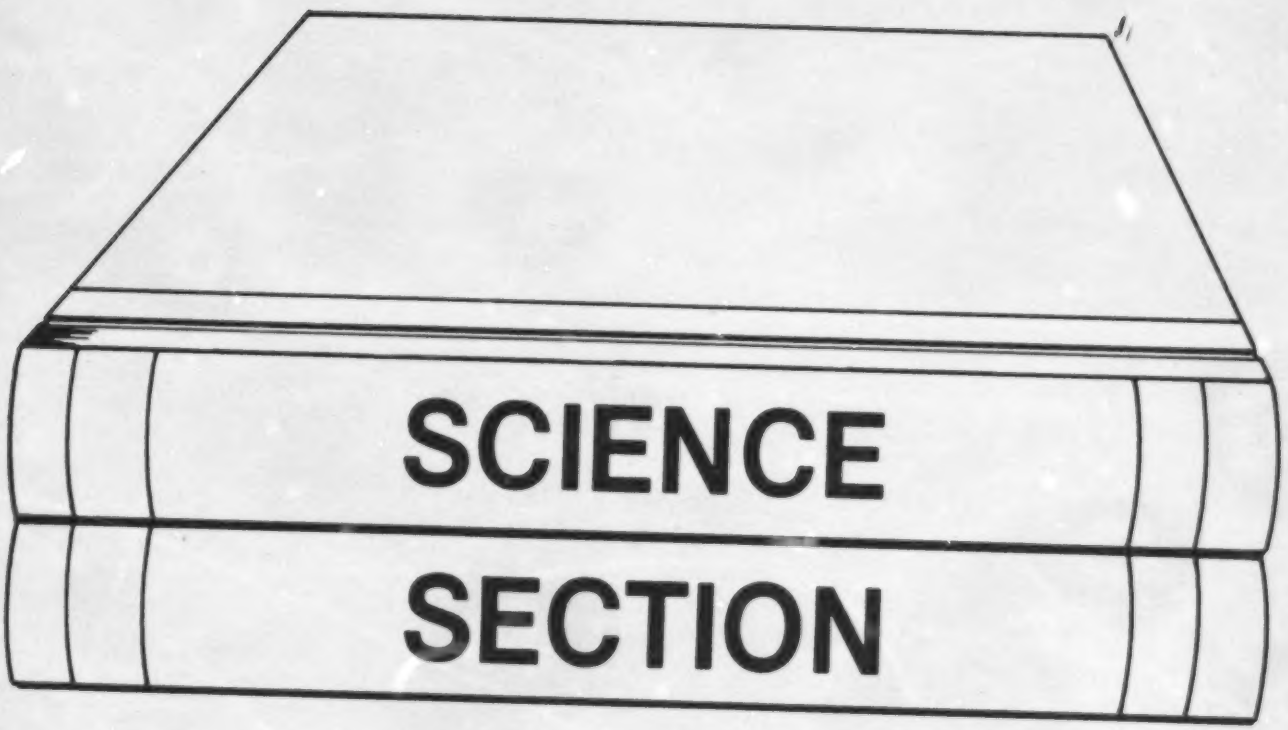
Public Attitudes Influence Consumer Products

Social Studies Activity #4
Worksheet

Directions: A) Individually, or in small groups, examine advertisements over a period of at least 10 years. These can be advertisements about automobiles, clothing, oil companies, energy products, or other related products which have changed over the years.

B) Identify how product construction and advertising has changed as the public has become more aware of energy limitations.

C) Make a list or write a paragraph regarding these conclusions.


SCIENCE
SECTION

Instructor Information...

Science Activities #1-3

Rationale:

Some students learn best through experimentation. "Gas From Grain" and "Collecting the Sun's Energy" give students a chance to investigate the conversion of sugar into alcohol and carbon dioxide as well as turning solar energy into electrical energy.

Student Objectives:

Students will be able to define energy, renewable and non-renewable sources.

Students will be able to develop alcohol from grain.

Students will be able to use a photovoltaic cell to convert sunlight into electrical energy.

Implementation:

Activity #1

Hand out "Energy Technology Review" sheets. Explain to students they are to complete this worksheet from what they know. If they need to use their glossary, they may do this. Once this is done, use this worksheet as a review of some important concepts on energy.

Activity #2

Explain the concept of gasohol to students. Hand out "Gas From Grain" worksheets (3 pages). Read over and explain it to students. **Note to Instructor**: The cracked grain or cornmeal used in the experiment should be added to water and cooked for 5-10 minutes, then cooled to room temperature, before initiating the experiment. Gather other materials listed and follow the procedure as stated. This experiment extends over a period of two or three days. Have students answer questions concerning the experiment after it has been completed.

Activity #3

Explain the concept of solar energy cells to students. Hand out the worksheets, "Collecting the Sun's Energy" (2 pages). Collect necessary materials beforehand.
Note: You will need to order a solar cell if you don't have acess to one. Follow the procedures stated and have students answer questions on the "Conclusions" sheet.

Name _____

Date _____

Energy Technology Review

Science Activity #1
Worksheet

Directions: Complete the following. You may use your glossary if necessary

1. In your own words define the word fuel. _____

2. Machines, cars, and tractors must use a fuel (such as gasoline) when they do work. Even animals and people need fuel in the form of food in order to do work. Look up a definition for the word "energy". (Use any science text, glossary, or dictionary. "Energy is:

The use of some form of fuel is often necessary to produce energy.

_____ is one energy source.

3. List 10 daily activities that require energy or the expenditure of some kind of fuel.

1. _____ 6. _____
2. _____ 7. _____
3. _____ 8. _____
4. _____ 9. _____
5. _____ 10. _____

4. List some energy sources available to man.

1. _____ 5. _____
2. _____ 6. _____
3. _____ 7. _____
4. _____ 8. _____

5. Find a definition for renewable: _____

Name _____

Date _____

Energy Technology Review

Science Activity #1
Worksheet, Page 2

6. Now decide what the term "non-renewable" must mean: _____

_____

Go back to the list of energy sources and put an "R" beside each renewable energy source and an "N" beside the non-renewable energy sources. Think carefully about each one!!!!

7. Look back at the list of energy sources and the notations you have made. Complete the following using the words "renewable" and "non-renewable" and your own conclusion.

   a. Energy sources that require the use of a fuel are _____ energy sources.

      What will eventually happen to these sources? _____

      _____

      _____

   b. Energy sources that exist freely due to the sun and earth's potential

      are _____ energy sources.

      Will these sources ever be used up? _____

8. Look at the list of energy sources again. Put a "T" by those sources that we use the most today. Are our current popular energy sources mostly renewable or non-renewable?

   _____

   _____

9. What will eventually happen if we continue to increase our use of these energy sources? _____

   _____

   _____

10. Can you make any suggestions that will help insure adequate power for the future?

    _____

    _____

    _____

Name _____

Date _____

Gas From Grain

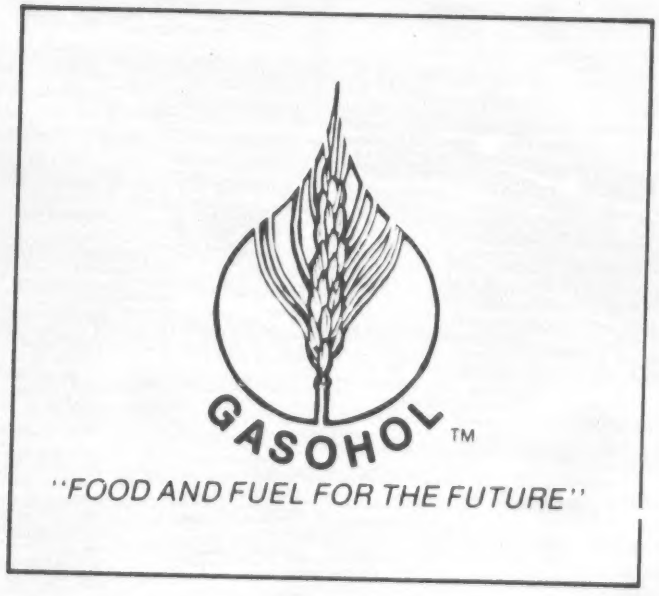
Science Activity #2
Worksheet

Scientists, in an effort to conserve our fossil fuels, particularly gasoline, have combined two fuels, alcohol and gasoline, to create a new fuel alternative—GASOHOL. Gasohol is made by combining 90 gallons of gasoline with 10 gallons of ethyl alcohol. The ethyl alcohol is a fuel that we can literally "grow" in Nebraska. It is made by the fermentation of grains. First, the grain is cracked, cooked and then an enzyme called "amylase" is added. Amylase breaks down starches (in the grain) into sugar. Yeast is then added to break down the sugar into alcohol and a colorless gas called carbon dioxide. This chemical reaction shows what happens during the production of gasohol.

STEP ONE: $C_6H_{10}O_5$ (Starch) + H_2O (Water) $\xrightarrow{\text{(Amylase)}}$ $C_6H_{12}O_6$ (Sugar)

STEP TWO: $C_6H_{12}O_6$ (Sugar) $\xrightarrow{\text{(Yeast)}}$ $2\,C_2H_5OH$ (Alcohol) + $2\,CO_2$ (Carbon Dioxide)

STEP THREE: 1 Part Alcohol + 9 Parts Gasoline = GASOHOL



Name _____

Date _____

Gas From Grain

Science Activity #2
Worksheet, Page 2

A. How could use of gasohol (90% gasoline, 10% alcohol) help to conserve gasoline reserves?

_____

_____

_____

B. Gasoline, a fossil fuel, is a _____ (renewable or non-renewable) resource.

Ethyl alcohol is a _____ (renewable or non-renewable) energy source.

C. To see how ethyl alcohol can be made from grain, you can do this experiment.

MATERIALS: 1) cracked grain or corn meal;
2) water; 3) test tube; 4) saliva; 5) yeast; and
6) a balloon.

Note: The cracked grain or corn meal should be added to water, cooked for 5-10 minutes, and cooled to room temperature.

PROCEDURE:

1) Fill a test tube ½ full of a mixture of cracked grain and water that was cooked and cooled by the teacher.

2) Amylase must now be added. This enzyme can be found in your saliva. It will break starch in the grain into sugar. Add amylase from your saliva to the grain in the test tube and let set overnight.

3) The next day, add a pinch of yeast and seal the top of the test tube with a balloon. The yeast will convert the sugar into alcohol and carbon dioxide.

4) Wait a day or two. What two (2) reactions tell you that fermentation has occurred?

_____

_____

Name _____

Date _____

Gas From Grain

Science Activity #2
Worksheet, Page 3

5) What three (3) substances are needed to generate sugar?

_____

_____

_____

6) In the lab you just completed, what starch did you use?

_____

7) What was your amylase source?

_____

_____

8) What products are generated when you added yeast to sugar?

_____

_____

_____

Name _____

Date _____

Collecting The Sun's Energy

Science Activity #3
Worksheet, Page 1

A. How close to a light bulb do you think you have to place a solar cell to make a motor run as fast as it does in sunlight? _____

After you have made your prediction, do the following experiment to see how close you came to predicting the correct distance.

B. You will need:
1. *Solar cell
2. Motor with spinner disc
3. Lamp with 100-watt bulb

C. Procedure:
1. Connect the solar cell and the motor.
2. Aim the solar cell out a sunlit window and notice how fast the motor turns.
3. Now, hold the photocell near a 100 watt bulb out of sunlight.

D. Conclusions:

1. How close does the solar cell have to be to the bulb, to equal the energy from the sun?

_____

_____

_____

2. What happens if you use bulbs of different wattage?

_____

_____

_____

3. What would happen if the bulb were in a reflector?

_____

_____

_____

* May be ordered from Radio Shack, 1024 "O" St., Lincoln, NE 68509, (402) 475-9001). As of 11/81 the cost was $3.95 each.)

Name _____

Date _____

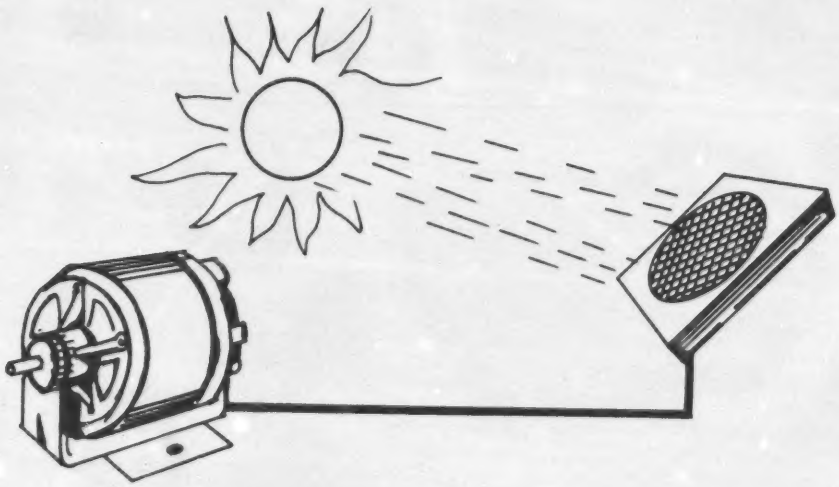
Collecting The Sun's Energy
Science Activity #3
Worksheet, Page 2

4. If you weren't allowed to move the solar cell during the day (to follow the sun), what would be the best direction to aim it?

_____

_____

_____



Energy: Yesterday, Today, and Tomorrow

Supplemental Materials Guide: **Alternatives To Fossil Fuels Activity**

Alder, Irving
Atomic Energy
John Day Company, 1971, 47 pp.

Barr, Donald
How and Why Wonder Book of Atomic Energy
Grosset & Dunlap: New York, 1961, 48 pp.

Energy Info—A Directory of Publications and Audiovisual Materials From The Nebraska Energy Office.
Nebraska Energy Office, Lincoln, Nebraska.

Faber, Doris
Enrico Fermi: Atomic Power
Prentice Hall, 1966.

Haber, Heinz
The Walt Disney Story of our Friend the Atom
Simon and Schuster: New York, 1956, 165 pp.

Halacy, D.S., Jr.
The Energy Trap
Four Winds Press: New York, 1975.

Keifer, Irene
Underground Furnaces: The Story of Geothermal Energy
William Morrow and Company, Inc.: New Jersey.

Knight, David C.
Harnessing the Sun: The Story of Solar Energy
William Morrow and Company: New York, 1976.

Reuben, Gabriel H. and Joseph Di Stefano
What is An Atom?
Benefic Press, 1960.

Ruchlis, Gyman
Thank you, Mr. Sun
Harvey House Publishers: New York, 1966, 45 pp.

Smith, Norman F.
Sun Power
Coward, McCann and Geoghegan, Inc.: New York, 1976, 46 pp.

Wohlrabe, Raymond A.
Exploring Solar Energy
The World Publishing Company, 1966, 89 pp.

Citizens Workshop on Energy and The Environment Handbook
Contact: Dean Metz, Wayne State College, Wayne, NE 68787.

Energy: Yesterday, Today, and Tomorrow

Supplemental Materials Guide: **Alternatives To Fossil Fuels Activity**

Books:

The Energy Challenge — free; activities with dittos.
Write to: The Energy Challenge
P.O. Box 14306
Dayton, Ohio 45414

The Dragons of Eden by Carl Sagan; Random House, New York; 1977, timeline.

62

Energy Information Request Form

Mail to: Nebraska Energy Office
P.O. Box 95085
Lincoln, NE 68509

NAME _____

ADDRESS _____

_____ Phone _____

Please forward publications on the following topics:

_____

_____

_____

_____

_____

_____

_____

_____

Please schedule the following audiovisual(s);

Title	Requested Date	Alternative Date
_____	_____	_____

_____ Place my name on the mailing list for the free bimonthly energy newsletter, **Nebraska Energy News**.

Energy: Yesterday, Today, and Tomorrow